IEEE P802.11
Wireless LANs

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| LMR timestamp clock and reporting |
| Date: 2020-10-28 |
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Abstract

This document proposes resolutions to TGaz LB249 comments related to the definition of the clock from which the FTM timestamps are reported.

The 44 TGaz LB249 CIDs addressed in this document are CIDs:

3789, 3790, and 3311.

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 3279 | 108.17 | 11.22.6 | It may not be entirely clear in the current standards and draft standard what the requirements are on the clock that the FTM time stamps are derived from. We should review this and if missing add specifications for how the clock that the FTM time stamps are derived from is related to the Tx carrier frequency and over what time intervals the clock is required to be continuous. | Review as per the comment and if missing, add specifications for how the clock that the FTM time stamps are derived from is related to the Tx carrier frequency and over what time intervals the clock is required to be continuous. Add this text in a new section where it is easy to find. In this section also refer to all other rules that relates to this and affects the FTM time stamps. | Revised. TGaz editor, make the changes as shown in document 11/20-1556r2. |
| 3280 | 111.06 | 11.22.6.1.3 | For TB ranging, and especially for Passive TB Ranging, to work well, it is desirable that the FTM clocks are continuous during each availability window used for FTM ranging. | Add requirement that the FTM clocks always need to be continuous during each availability window used for FTM ranging. | Revised. TGaz editor, make the changes as shown in document 11/20-1556r2. |

**Discussion for CIDs 3279 and 3280:** For ranging we always need the clock to run continuously between the TOD time and the TOA time. For Passive TB Ranging, as an ISTA can receive and measure the TOA of an NDP both before and after it transmits its own NDP, we need to expand on the requirement what is needed for TB Ranging. Either way we don’t have this specified also for TB Ranging. We here propose to solve this problem for both TB Ranging and Passive TB Ranging by specifying that the time stamps reported within each availability window shall be derived from a clock that runs continuously during the availability window and runs at a rate that is locked relative to the clock generating the carrier frequency. This also solves the problem that we need the FTM time-stamping clock to run at the rate as the clock that generates the carrier.

***TGaz Editor: Change the text in Subclause 11.21.6.1 (Overview – In 11.21.6 Fine timing measurement (FTM) procedure) as follows):***

**11.21.6.1 General**

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Since some of the ISTA’s activities may be nondeterministic and might have higher precedence than the FTM session (e.g., data transfer interaction with an associated AP), a conflict might prevent the ISTA from being available at the scheduled time window(s) for executing the ranging measurement exchange(s). The FTM procedure provides mechanisms as described in 11.21.6.1.1 (EDCA based ranging and TB Ranging overview) and 11.21.6.1.2 (Non-TB Ranging overview) to ensure that the ISTA is available to execute the ranging measurement exchange as scheduled.

The frequency of the clock for the FTM timestamps shall be derived from the same reference oscillator as the transmit center frequency and the symbol clock frequency. **(#3279)**

NOTE – The transmit center frequency and symbol clock frequency are in derived from the same reference oscillator, as per the specifications for the different PHYs.

***TGaz Editor: Change the text in Subclause 11.21.6.4.3.1 (General – In 11.21.6.4.3 TB Ranging measurement exchange) as follows):***

**11.21.6.4.3.1 General**

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During the availability window, measurement resources and results are made available to each ISTA whose poll response was received at the RSTA; see 11.22.6.4.3.3 (Measurement Sounding Phase of TB Ranging) and 11.22.6.4.3.4 (Reporting Phase of TB Ranging Measurement) (#**2156**). This may also lead to extra instances of polling/sounding/reporting triplets, even if all ISTAs assigned to this availability window were polled in the first polling phase instance (e.g., if the RSTA is not able to accommodate all ISTAs that responded in a single measurement sounding phase instance; see 11.22.6.4.3.3 (Measurement sounding phase of TB Ranging).

The timestamps reported within each availability window shall be derived from a clock that runs continuously during the availability window. **(#3279, #3280)**

NOTE – The clock used for the timestamps is allowed to wrap within an availability window, or elsewhere.

In some use cases it may be of interest to have a clock that runs continuously across subsequent ranging availability windows. For this reason it is desirable for the clock for the FTM timestamping to in general run continuously.

If there is a break in the discontinuity in the clock for the FTM timestamping between two reported TOD timestamps, then the subfield ‘TOD Not Continuous’ in the TOD Error field of Location Measurement Report frame shall be used to indicate a break in the continuity of the FTM timestamp clock.

Within each availability window, an RSTA shall use an AID or Ranging Session ID (RSID) to identify an associated or unassociated ISTA respectively. The AID and RSID assignment shall be non-conflicting and shall have the same size and valid address space (as defined in 9.4.1.8 and 26.17.4). The RSID usage shall follow the same rules as that of AIDs for HE operations. The RSIDs are assigned to unassociated ISTAs during the FTM negotiation; see 11.22.6.3 (Fine timing measurement procedure negotiation).

***TGaz Editor: Change the text in Subclause 11.21.6.4.8.1 (General – In 11.21.6.4.8 Measurement exchange in Passive TB Ranging mode) as follows):***

**11.21.6.4.8.1 General**

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The Passive TB Ranging exchanges occur in an availability window used for passive location.

If there is a break in the discontinuity in the clock for the FTM timestamping between two reported TOD timestamps, then the subfield ‘TOD Not Continuous’ in the Timestamp Error subfield of the Time Stamp Measurement Report field in the ISTA Passive TB Ranging Measurement Report element shall be used to indicate a break in the continuity of the FTM timestamp clock. **(#3279, #3280)**

Within each availability window, an RSTA shall use an AID or Ranging Session ID (RSID) to identify an associated or unassociated ISTA respectively. The AID and RSID assignment shall be non-conflicting

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| **CID** | **P.L** | **Clause** | **Comment** | **Proposed change** | **Proposed resolution** |
| 3311 | 122.31 | 11.22.6.3.3 | It is not specified how phase shift feedback reporting works if the ISTA is reporting phase shift TOAs in non-TB and TB ranging. How will the ISTA get the required information from the RSTA in order to compute the RTT? | Add specification and description for the case when the ISTA is reporting phase shift TOAs in non-TB and TB ranging and how the ISTA will get the required information from the RSTA in order to compute the RTT. | Revised. TGaz editor, make the changes as shown in document 11/20-1556r2. |

**Discussion for CIDs 3311:** When the ISTA is reporting PSTOA timestamps, the ISTA needs to get an adjusted TOA (or TOD but we chose to adjust the TOA) from the RSTA so that when it calculates the range, using its reported PSTOA in place of of its TOA, it comes out correct.

***TGaz Editor: Change the text in Subclause 11.21.6.3.3 (Negotiation for TB and Non-TB Ranging measurement exchange) as follows):***

**11.21.6.3.3 Negotiation for TB and Non-TB Ranging measurement exchange**

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An ISTA and an RSTA may negotiate a phase shift feedback mode of the Non-TB Ranging and TB Ranging measurement exchange (11.21.6.4.3), for either the RSTA2ISTA LMR and/or ISTA2RSTA LMR. In this case, instead of the TOA t2 of the I2R NDP, the RSTA2ISTA LMR carries the phase shift tp2 of I2R NDP and instead of the TOA t4 of the R2I NDP, the I2R LMR carries phase shift tp4 of R2I NDP. The ISTA and RSTA can use Equations (11-xx) and (11-yy) to derive the RTT.

When an ISTA has negotiated to report phase shift feedback, the RSTA shall measure both the TOA and PSTOA on the ranging NDP it receives from the ISTA and shall subtract the difference from the TOA it reports to the ISTA in the R2I LMR frame. This way, when the ISTA uses this adjusted RSTA TOA when it calculates its RTT combined with its own reported PSTOA, the calculated RTT comes out right.

An RSTA in which dot11PhaseShiftFeedbackImplemented is true shall set the Phase Shift Feedback Support field in the Extended Capabilities element to 1 to indicate RSTA’s capability.

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**References:**

**[1] Draft P802.11az\_D2.4**